WHAT IS CLAIMED IS:

1. A computer-implemented method for determining one or more properties of an insulating film formed on a substrate, comprising:

obtaining a charge density measurement of the insulating film;

obtaining a voltage measurement of a surface voltage potential of the insulating film relative to a bulk voltage potential of the substrate corresponding to the charge density measurement;

obtaining a rate of voltage decay of the voltage measurement; and

determining the one or more properties of the insulating film using the charge density measurement, the voltage measurement, and the rate of voltage decay.

2. The method of claim 1, wherein the one or more properties comprise capacitance and resistance.

3. The method of claim 1, wherein the one or more properties comprise capacitance and resistance, the method further comprising determining a frequency dependency of a device comprising the insulating film and the substrate in the presence of current leakage through the insulating film using the capacitance and the resistance.

4. The method of claim 1, wherein the one or more properties comprise capacitance and resistance, the method further comprising determining a thickness of the insulating layer from the capacitance and the resistance.

5. The method of claim 1, wherein determining the one or more properties comprises altering the voltage measurement using the rate of voltage decay and using the altered voltage measurement and the charge density measurement to calculate the one or more properties.

6. The method of claim 1, wherein obtaining a charge density measurement comprises depositing a charge onto a surface of the insulating film, measuring the charge density of the charge, and recording the times at which the depositing and the measuring were performed.

7. The method of claim 1, wherein obtaining a voltage measurement comprises depositing a charge onto a surface of the insulating film, measuring the voltage, and recording the times at which the depositing and the measuring were performed.

8. The method of claim 1, wherein obtaining a rate of voltage decay comprises measuring the rate of voltage decay subsequent to obtaining a voltage measurement.

9. The method of claim 1, wherein obtaining a rate of voltage decay comprises measuring the rate of voltage decay prior to obtaining a voltage measurement.

10. The method of claim 1, wherein obtaining a rate of voltage decay comprises determining the rate of voltage decay using a theoretical model.

11. The method of claim 1, wherein obtaining a voltage measurement comprises measuring the voltage in accumulation, depletion, inversion, or a combination thereof.

12. The method of claim 1, wherein the one or more properties comprise capacitance, the method further comprising determining a thickness of the insulating film using the rate of voltage decay and a theoretical model relating leakage to insulating film thickness and determining a dielectric constant of the insulating film using the capacitance and the thickness.

13. The method of claim 1, wherein the one or more properties comprises capacitance, the method further comprising obtaining a thickness of the insulating film determined by an additional experimental method and determining a dielectric constant of the insulating film using the capacitance and the thickness.

14. The method of claim 1, further comprising altering a parameter of an instrument coupled to a process tool in response to at least one of the one or more properties of the insulating film using a feedback control technique.

15. The method of claim 1, further comprising altering a parameter of an instrument coupled to a process tool in response to at least one of the one or more properties of the insulating film using a feedforward control technique.

16. A method for determining a thickness of an insulating film formed on a substrate, comprising:

depositing a charge on the insulating film;

measuring a surface voltage potential of the insulating film relative to a bulk voltage potential of the substrate corresponding to the charge;

measuring a rate of voltage decay of the insulating film; and

determining the thickness of the insulating film using the rate of voltage decay and a theoretical model relating leakage to insulating film thickness.

17. The method of claim 16, wherein the depositing comprises depositing the charge on a surface of the insulating film using a non-contact technique, and wherein measuring the surface voltage potential comprises measuring the surface voltage potential using a non-contact technique.

18. The method of claim 16, wherein measuring the rate of voltage decay comprises measuring the rate of voltage decay prior to measuring the surface voltage potential.

19. The method of claim 16, wherein depositing the charge, measuring the surface voltage potential, and measuring the rate of voltage decay are performed at different times.

20. The method of claim 16, wherein the theoretical model comprises the Fowler-Nordheim tunneling model.

21. The method of claim 16, wherein the theoretical model comprises a direct tunneling model.

22. The method of claim 16, wherein the depositing comprises substantially uniformly depositing the charge on an area of the insulating film, wherein measuring the surface voltage potential comprises measuring the surface voltage potential over the area, and wherein measuring the rate of voltage decay comprises measuring the rate of voltage decay over the area, the method further comprising generating a map of the surface voltage potential and the rate of voltage decay over the area.

23. The method of claim 16, wherein measuring the surface voltage potential comprises measuring the surface voltage potential in accumulation, depletion, inversion, or a combination thereof.

24. The method of claim 16, further comprising directing light toward the insulating film during measurement of the surface voltage potential and during measurement of the rate of voltage decay.

25. The method of claim 16, further comprising altering a parameter of an instrument coupled to a process tool in response to the thickness of the insulating film using a feedback control technique.

26. The method of claim 16, further comprising altering a parameter of an instrument coupled to a process tool in response to the thickness of the insulating film using a feedforward control technique.

27. A method for determining a property of an insulating film formed on a substrate, comprising:

depositing a charge on the insulating film to generate an electric field across the insulating film, wherein the electric field is selected to reduce leakage of the insulating film;

measuring a characteristic of the insulating film at the electric field; and

determining the property of the insulating film using the characteristic.

28. The method of claim 27, wherein the electric field is less than about 0.2 MV/cm.

29. The method of claim 27, wherein the electric field is about 0 MV/cm.

30. The method of claim 27, wherein the electric field is selected using an empirical method.

31. The method of claim 27, wherein the electric field is selected using an experimental method.